



### ARCHITECTURAL MERIT

Recently completed, the City Square project, also known as Brookfield Place, is Perth's newest high-rise commercial office building. Constructed by Brookfield Multiplex, the building incorporates many design features aiming to place it at the leading edge of the high-rise commercial building market.

The overall architectural design of the building aims to make a bold statement on behalf of the main tenant, BHP Billiton. The building is a dominant structure on the Perth skyline with the BHP name proudly displayed. The building features an off-set core on the north side of the building, allowing a largely open-plan internal office layout with floor to ceiling glass achieving uninterrupted spectacular views over the Swan River, to the south and to the sea.

The 47 floors and roof above the plaza are all steel framed. Composite steel beams span between the circular structural columns and support Fielder permanent formwork decking with cast-in-situ concrete slab floors.

To compensate for the offset core, the designers incorporated a highly visible bracing system to the eastern and western ends of the building. This bracing consists of welded column sections outside the glass line of the building, and is clad to

match the corner 'mega-columns'. The bracing continues beyond the roof of the building to form the highly visible 'column capitol' or 'tiara' structure which rises a further 8 storeys above the roof of the building.

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Whilst the basement level floors were constructed in concrete, the 47 floors and roof above the plaza are all steel framed. Composite steel beams span between the circular structural columns and support Fielder permanent formwork decking with cast-in-situ concrete slab floors. Structural columns for the tower utilise spiral welded steel tubes with bolted end splices and pre-installed reinforcing cages.

### INNOVATIVE USE OF STEEL

Utilising the latest steel manufacturing technologies, such as robotic profile cutting of column tubes and CNC profile cutting to form a variety of complex shapes, allowed the project to go together quickly, efficiently and with minimal time or material wastage. The use of a single 3D model in conjunction with Computer Aided Manufacturing Technologies allowed for highly accurate fabrication and construction.







## EFFICIENT USE OF STEEL PRODUCTS

The design of the floor structure assisted in achieving improved speed of construction. The delivery and construction process achieved a 6-day floor to floor cycle during typical floors, for a typical floor area approaching 2200m<sup>2</sup>. Deliveries of all structural floor components were scheduled and packed to minimise the number of crane lifts to erect each floor, to virtually eliminate double handling of members and to eliminate the need to store any surplus materials on site. The result was a highly efficient construction process.

Due to a highly efficient scheduling and delivery system which virtually eliminated double handling of members, a 6 day floor to floor construction cycle was achieved for a typical floor area approaching 2200m<sup>2</sup>.

Construction site safety was managed by Brookfield Multiplex and their site crews with ongoing communication with the workshop to ensure that any unnecessary safety issues were dealt with prior to delivery of the steelwork. The erection of the frame was contained within a climbing safety screen system with all work being carried out on recently poured concrete slabs. This provided a very safe and well controlled working environment for the front line rigging crews.

The decision to go down the path of steel framed construction was made in an environment where availability of skilled labour was a major issue for the construction industry in Perth, and the reduced workforce numbers on site for a steel frame was







considered a major advantage, not least of all in the area of safety. A strong planning effort at the front end of the project had the effect that the main body of the building was delivered within the original cost expectations of the project team.

### ENVIRONMENTAL PERFORMANCE

Brookfield Multiplex undertook an extensive process of environmental management for the project aiming to achieve strong credentials in this field.

The City Square project is targeting a 5 Green Star Design rating and a 5 Star ABGR base building energy rating against Green Star ABGR Building Protocols.



Office floors were designed to achieve a range of potential internal fitouts, with the option to vary these fitouts in the future. Design features such as framing to assist with alternative future internal stair void setouts, services zones in ceilings to allow for future services fitouts and an access floor throughout the building to allow for flexibility in the open-plan office environment, have all assisted to achieving a true future-proofing of the building.

### BUILDABILITY

All structural steelwork for the project was 3D modelled using the Bocad design and detailing software. The outcome was an exceptional accuracy and quality of construction with miniscule defect rates throughout the works.

The design of the building structure incorporates many features aimed at both off-site manufacturing efficiency and on-site construction efficiency. In addition, the fabrication process aimed to maximise the use of manufacturing technologies to achieve improved economies and quality of construction.

The entire project was managed utilising the ACONEX on-line collaboration platform which not only stores all information on the project, but provides a mechanism for highly efficient communication and collaboration amongst the design and construction team.





All structural steelwork for the project was 3D modelled using the Bocad design and detailing software. Bocad outputs interfaced directly with Computed Aided Manufacturing technologies in the PIC workshop to achieve seamless transfer of information. This allowed beamline manufacture, robotic profile cutting of column tubes and CNC profile cutting of thousands of complex shapes and fitments for the project. The outcome was an exceptional accuracy and quality of construction with miniscule defect rates throughout the works.

An example of the interfacing of technologies was the use of 3D models on site by the riggers during the erection of the steel frame to assist them in understanding the more complex parts of the structure.

#### PROJECT TEAM

<b>Architects:</b>	HASELL, fitzpatrick+partners
<b>Structural Engineer:</b>	Aurecon
<b>Head Building Contractor:</b>	Brookfield Multiplex
<b>Steel Fabricators:</b>	Pacific Industrial Company, Steelpipe Australia
<b>Steel Detailer:</b>	Detailed Design Drafting
<b>Steel Manufacturers:</b>	BlueScope, OneSteel, Orrcon Steel
<b>Steel Distributors:</b>	BlueScope Distribution, Southern Steel
<b>Coatings Supplier:</b>	Dulux

